YELLOWTAIL RESERVOIR

Yellowtail Dam will form a reservoir 71 miles long, of which 47 miles will be in the rugged Bighorn Canyon. The canyon ends about 4½ miles south of the Montana-Wyoming boundary, and there the reservoir will increase to a maximum width of 2 miles. The reservoir will have a capacity of 1,375,000 acre-feet. The maximum depth of the reservoir will be 500 feet, and the surface area 17,300 acres (27 square miles).

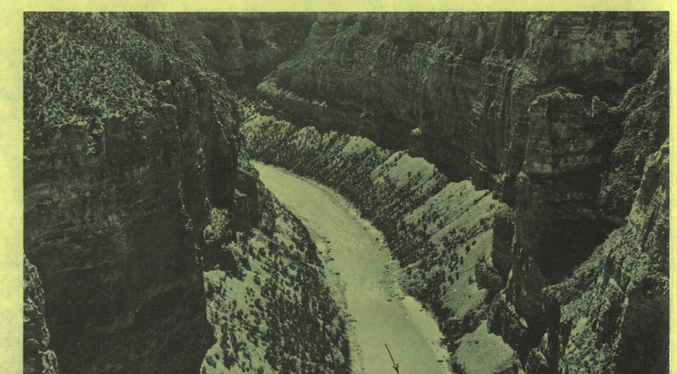
The Bighorn Canyon is one of the famous deep water-cut gorges of the West. It was known by the white man even before William Clark of the Lewis & Clark Expedition camped at the mouth of the Bighorn River in July 1806. In the following decades, many famous fur traders used the river and the canyon as a part of their water route for transporting beaver and otter pelts to St. Louis. Much later—in 1866—the United States Army established Fort C. F. Smith, near the mouth of the canyon, to guard the Bozeman Trail, the route from Fort Laramie, on the Oregon Trail, to the Three Forks of the Missouri. The new community, serving construction forces and Government employees during the construction of Yellowtail Unit, has been named Fort Smith. The community is about a mile west of the almost obliterated ruins of Fort C. F. Smith.

The area needed for Yellowtail Unit includes 5,678 acres of Crow Indian Tribal land, which includes the damsite and part of the site of the construction camp and Government community; 727 acres of allotted Indian land; 12,320 acres of private land; 2,900 acres of State land; and 10,482 acres of public domain—a total of 32,107 acres. The Crow Tribal land was acquired under an act of the Congress in 1958. Of the 32,107 acres required, 39 percent of the land is in Montana and 61 percent in Wyoming.

Proposed Bighorn Canyon National Recreation Area

The Bighorn Canyon is the passageway of the Bighorn River between the Pryor Mountains and the northern end of the Bighorn Mountains. Members of the Montana and Wyoming Congressional delegations have introduced a bill which would establish a Bighorn Canyon National Recreation Area. For 47 river miles, Yellowtail Reservoir will lie within this rugged canyon, where steep walls tower hundreds of feet above the river. The upland prairie and the awesomely beautiful Bighorn Canyon provide a remarkable natural setting that will be enjoyed by many people when the impounded river forms a safe water highway into what has formerly been an almost inaccessible region. The use of the reservoir and surrounding lands would be unusually diversified. Water-related activities would be the basic attraction with outstanding opportunities for boat trips and scheduled cruises. Fishing should be good, whether along the river below the dam, on the reservoir, or up the various trout streams that will feed into the reservoir. Other activities on the surrounding terrain will include camping, picnicking hiking, riding, scenic drives, historical and archeological interests, the dam itself, bird and wildlife watching, hunting, and geological interest including nearby caves. The National Park Service plan proposes a National Recreation Area that would include approximately 63,287 acres.

At left, above: Broken line shows approximate reservoir water surface elevation, Bighorn Canyon, at the mouth of the Big Bull Elk Canyon and Little Elk Canyon. Below: A reach of Bighorn Canyon upstream from the mouth of Dry Head Creek.



Physical Data

DAM:

Type	concrete arch
Height above foundation (feet)	525
Crest length (feet)	1,450
Crest width (feet)	22
Crest elevation (feet)	3,660
Base thickness at center of arch (feet)	About 145
Volume (cubic yards)	1,453,000
Spillway: 32-foot diameter tunnel in left abutment, controlled by two radial gates 25 feet wide by 64.4 feet high. Discharge capacity at water surface elevation 3660 (cubic feet per second)	92,000

Outlet works:
River outlets—two 84-inch diameter conduits through dam, controlled by 84-inch diameter hollow-jet valves. Discharge capacity (cubic feet per second)...5,000
Power outlets: Four 12-foot diameter penstocks through dam.

RESERVOIR:

Capacity (acre-feet at elevation 3657)	1,375,000
Area (acres at elevation 3657)	17,300
Length (river miles at elevation 3657)	71
Water surface elevation (joint-use storage)	3,640
Water surface elevation (flood-control storage)	3,657

POWERPLANT:

Indoor type, housed in structural-steel framework building faced with brick. Vertical-shaft generators direct-connected to Francis-type turbines.

Total capacity (kilowatts)	250,000
Number of units	4
Capacity each generator (kilowatts)	62,500
Capacity each turbine (horsepower)	87,500

General information about Yellowtail Unit can be obtained from the Regional Director, Bureau of Reclamation, Region 6, Billings, Mont., or from the Project Construction Engineer, Yellowtail Project Office, Fort Smith, Mont. (Mail address: Hardin, Mont.)

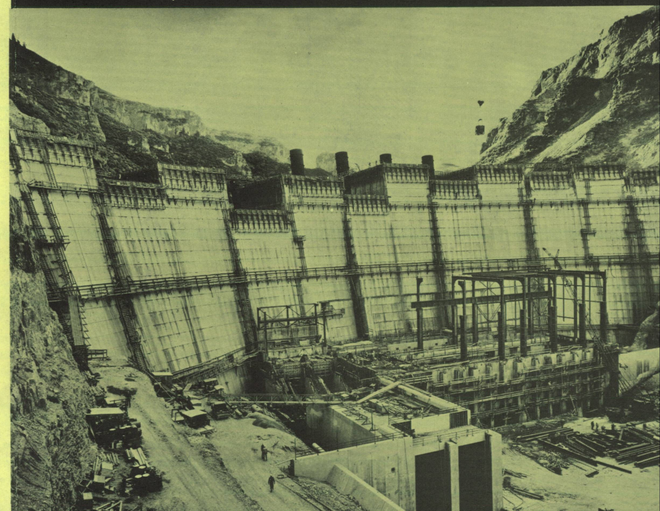
In its assigned function as the Nation's principal natural resource agency, the Department of the Interior bears a special obligation to assure that our expendable resources are conserved, that renewable resources are managed to produce optimum yields, and that all resources contribute their full measure to the progress, prosperity, and security of America, now and in the future. (1963)

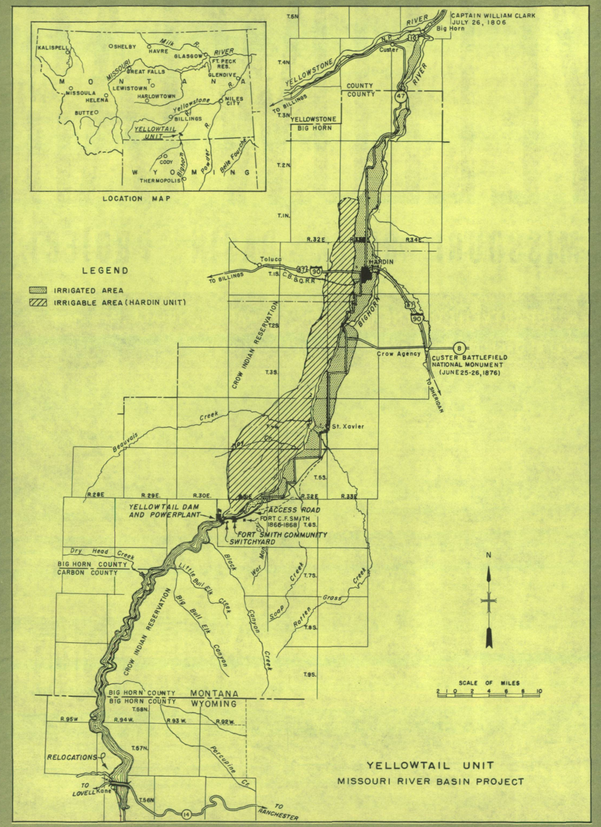
GPO 839-109

YELLOWTAIL UNIT

MISSOURI RIVER BASIN PROJECT

U. S. DEPARTMENT OF THE INTERIOR, STEWART L. UDALL, Secretary
Bureau of Reclamation, Floyd E. Dominy, Commissioner





YELLOWTAIL UNIT

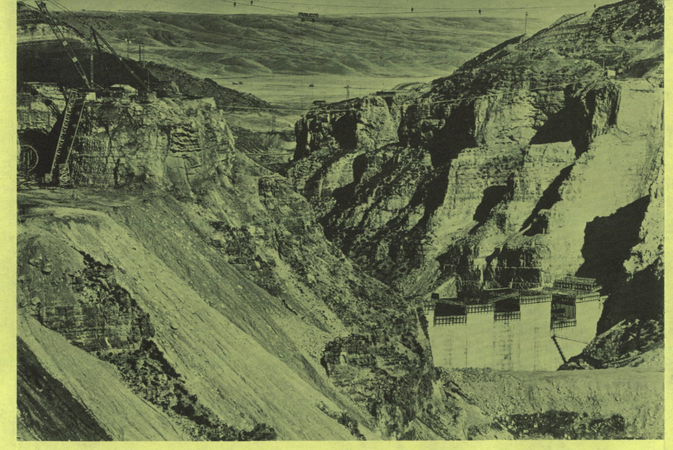
Yellowtail Unit consists of a dam, reservoir, powerplant, switchyard, and afterbay dam. The unit is a part of the Missouri River Basin Project, a resource development program authorized in the Flood Control Act of 1944, and subsequent legislation, for the conservation, control and use of the water resources of the Missouri River Basin. Yellowtail Dam is in Montana, on the Bighorn River near the mouth of the Bighorn Canyon, 45 road miles southwest of Hardin and 43 air miles southeast of Billings. The reservoir will extend into Wyoming.

Yellowtail Dam, Reservoir, and Powerplant, major features of the unit, are under construction. The dam, an arch-type structure rising 525 feet above bedrock, will have a crest length of 1,450 feet, a crest width of 22 feet, and a maximum base thickness of about 145 feet at the center of the arch. Yellowtail Dam is the 27th storage dam to be built by the Bureau of Reclamation as a part of the Missouri River Basin Project. The structure will be the largest concrete dam in the Missouri River Basin and the seventh highest concrete dam in the United States.

Yellowtail Reservoir, with a capacity of 1,375,000 acre-feet, will be regulated for multiple-purpose use. Irrigation and power generation are major benefits that will accrue through the construction of the unit. Other major benefits of the Yellowtail Unit include flood control, sediment retention, improvement of fish and wildlife resources, and recreational opportunities.

Water stored in Yellowtail Reservoir can be used for irrigating the proposed 43,600-acre Hardin Unit, immediately downstream from the dam. A large part of the arable area in the Hardin Unit lies in an almost continuous strip, 2 to 3 miles wide and about 40 miles long, extending along the west side of the Bighorn River. Currently, large dryland wheat farms are operated in the area. About two-thirds of the land in the proposed unit is within the Crow Indian Reservation, and about half the land is Indian-owned. Provision has been made for diverting water from the reservoir through a tunnel in the left abutment of the dam to the future irrigation works of the Hardin Unit. The reservoir will also provide part of the water for the proposed Yellowstone Pumping Units, located along the Yellowstone River Valley.

The powerhouse, under construction at the foot of the dam, will occupy nearly the entire width of the riverbed. Four 62,500-kilowatt generators will be installed. The vertical-type generators will be driven by 87,500-horsepower hydraulic turbines. Individual penstocks, 12 feet in diameter and 395 feet long, will convey the water to the turbines. The penstock inlets, at the upstream face of the dam, will be 210 feet below the crest of the dam. Electricity from the 250,000-kilowatt powerplant will be integrated with the energy produced at other Federal powerplants in the Missouri River Basin, and will be used to meet the expanding power needs in northern Wyoming, eastern Montana, and portions of western North Dakota and South Dakota.



CONSTRUCTION

The prime contract for the construction of the dam and powerplant, totaling about $40 million, was awarded April 24, 1961, to a joint venture consisting of Morrison-Knudsen Co., Inc., Boise, Idaho; The Kaiser Co., Inc., Oakland, Calif.; Perini Corp., Framingham, Mass.; Walsh Construction Co., Davenport, Iowa; and F & S Contracting Co., Butte, Mont. The five firms are organized as the Yellowtail Constructors, Inc.

Initial excavation of the abutments of the dam started during the summer of 1961 and driving of the diversion and spillway tunnels began in December. The 840-foot diversion tunnel was driven laterally into the cliff, and intersected the spillway tunnel at river level. About 1,240 feet of the spillway tunnel is being used during the diversion period. Diversion of the flows of the Bighorn River was made on January 22, 1963. With the earth-and-rock cofferdams closed and the diversion tunnel in service, stripping and grouting of the riverbed foundation started and on March 15, 1963, the first bucket of mass concrete was placed in Yellowtail Dam.

During the 1963 season, work continued on the steeply inclined horizontal leg of the spillway tunnel. The spillway tunnel, 32 feet in diameter, begins with a double-gated intake structure and shoots downward on a 55-degree incline for 420 feet where it meets the diversion tunnel. Major construction is scheduled for completion in 1966.

The Yellowtail Switchyard site is on the east rim of the canyon high above the dam and powerplant. Power will be generated at 13,800 volts, transformed to 115,000 and 230,000 volts at the powerplant, and then transmitted through high-voltage cables to the switchyard. Interconnection with the Bureau of Reclamation's Eastern Division Power System will be made through the Yellowtail-Dawson County 230,000-volt transmission line (221 miles) and with the Western Division Power System through the Yellowtail-Lovell 115,000-volt transmission line (46 miles). Construction of the switchyard and transmission facilities are timed to become operational with initial generation from the powerplant in 1966.

The Yellowtail Afterbay Dam, 2¼ miles downstream from Yellowtail Dam, will be an earthfill and concrete structure about 53 feet high and about 1,370 feet long with a gated-overflow spillway and sluiceway. The afterbay dam will re-regulate releases from the powerplant to provide relatively uniform flow in the river downstream.

Construction activities in progress in the reservoir area include clearing operations, and the relocation of 6 miles of the Chicago, Burlington and Quincy Railroad required in the upper end of the reservoir. Future activities in the same area include the relocation of the railroad's facilities at Kane, Wyo., and construction of a mile of causeway across the reservoir to raise Wyoming State Highway No. 14 above the water surface. A new bridge, at the end of the causeway, has been constructed by the Wyoming State Highway Department.

At left, above: At extreme left, construction in progress on the spillway intake structure at the entrance to the spillway tunnel. Below: A conveyor belt system, 4,615 feet long, carries a continuous river of gravel to the concrete mixing plant above the dam's crest.